Transforming F0 Contours

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Introduction

Goal

To transform the F0 contour of some speech from a source speaker, such that listeners believe it to have been uttered by some target speaker

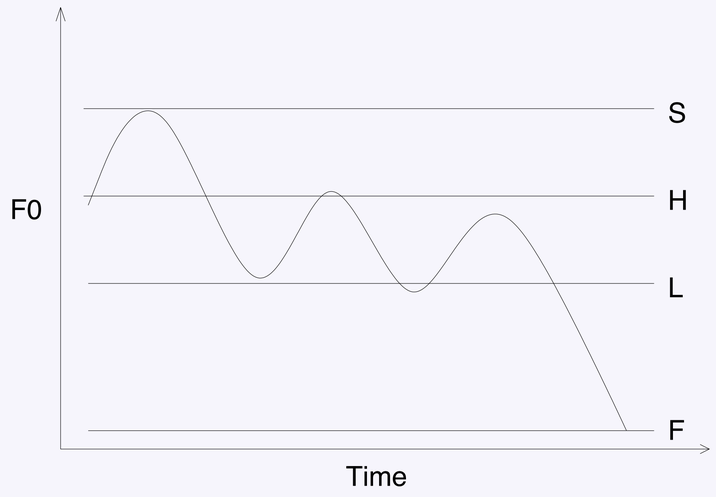
Applications

- voice transformation
  - also need a method for transforming voice quality - see poster by King & Gillett in session PWeBe
- speech synthesis
  - as a way of adapting existing intonation models (trained on one speaker) to a new speaker, without having to annotate much more data

Parameter set

After Patterson

- sentence-initial high (S)
- non-initial accent peaks (H)
- post-accent valleys (L)
- sentence-final low (F)



Mapping

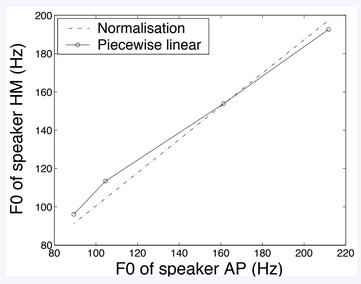
Standard method

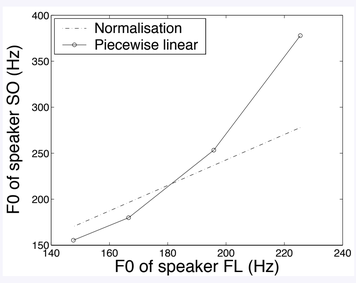
Usual method of normalising F0 is to use this mapping

$$M_N(x) = ((x - \mu_{\text{src}})/\sigma_{\text{src}}) * \sigma_{\text{targ}} + \mu_{\text{targ}}$$

New method

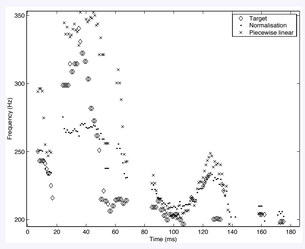
A nonlinear mapping, M_{PL}, composed of piecewise linear sections between F, L, H and S



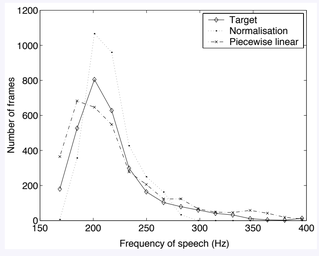


Examples

Transformed contours



Histograms



Audio examples

Evaluation

Perceptual experiment

25 subjects presented with speech from target speaker and speech with transformed F0 contours ("imitator speech") in XABX format. Asked to judge which of A or B was most like X. A and B varied between: actual target F0, normalised F0 (standard method), transformed F0 (new method).

Speaker pairs classified as "similar" (S_{same}) or "different" ($S_{\text{different}}$).

Results

	Mean (%)	Std. Dev.	α	t
Preference for M_{PL} over M_N for $S_{\text{different}}$	**67**	10	$< 1 \times 10^{-7}$	-8.71
Preference for M_{PL} over M_N for S_{same}	54	8	~ 0.02	-2.49
Preference for target over mapped contours	73	9	$< 1 \times 10^{-11}$	-13.8

What next?

Apply the method to full voice transformation or speech synthesis

See also...

- at this conference:
  - poster by Gillett & King in session PWeBe (voice *quality* transformation)
- **www.cstr.ed.ac.uk**
  for latest progress on voice transformation and speech synthesis
- **www.camelaudio.com**
  for musical instrument transformation and morphing